THE ASTROBIOLOGY EXPLORER (ABE) MIDEX MISSION CONCEPT – EXPLORING THE LINKS BETWEEN THE INTERSTELLAR MEDIUM AND METEORITES. S. A. Sandford, NASA Ames Research Center MS 245-6, Moffett Field CA, USA 94035-1000.

Introduction: Infrared spectroscopy in the 2.5-16 micron range is a principle means by which organic compounds can be detected and identified in space via their vibrational transitions. Ground-based, airborne, and spaceborne IR spectral studies have already demonstrated that a significant fraction of the carbon in the interstellar medium (ISM) resides in the form of complex organic molecular species [1]. Furthermore, the presence of D-enriched organics in meteorites suggests that a portion of these materials survives incorporation into protosolar nebulae [2,3]. Unfortunately, neither the distribution of these materials in space nor their genetic and evolutionary relationships with each other or their environments are well understood. The Astrobiology Explorer (ABE) is a MIDEX mission concept currently under study at NASA's Ames Research Center in collaboration with Ball Aerospace and Technologies Corporation [4]. ABE will conduct mid-IR spectroscopic observations to address outstanding important problems in astrobiology, astrochemistry, and astrophysics. The core observational program would make fundamental scientific progress in understanding (1) the evolution of ices and organic matter in dense molecular clouds and young forming stellar systems, (2) the chemical evolution of organic molecules in the ISM as they transition from AGB outflows to planetary nebulae to the general diffuse ISM to HII regions and dense clouds, (3) the distribution of organics in the diffuse ISM, (4) the nature of organics in the Solar System (in comets, asteroids, satellites), and (5) the nature and distribution of organics in local galaxies of a variety of types. In addition, ABE will attempt to detect and quantify deuterium enrichments in a select set of these materials and environments. This should assist both with understanding the chemical processes that occur in these environments and with establishing any links that exist between interstellar and meteoritic organics.

ABE at a Glance

Telescope Diameter	60 cm
Orbit	MEO or Earth-driftaway
Cryogenic Lifetime	1.0-1.5 years
Telescope Temperature	< 50 K
Pointing Stability	2.5-3.0” rms
Wavelength Range	2.5-5.1 μm and 4.9-16 μm
Spectral Resolution ($\lambda/\Delta\lambda$)	2000-3000
Detector Array Size	1024 x 1024 pixels
Detector Array Types	InSb and Si:As

References: [1] Sandford S. A. (1996). *Meteoritics and Planet. Sci.*, 31, 449-476. [2] Zinner E. (1997) In *Astrophysical Implications of the Laboratory Study of Presolar Materials* (eds. T. Bernatowicz and E. Zinner), pp. 3-26. [3] Sandford S. A., Bernstein M. P., & Dworkin J. P. (2001). *Meteoritics and Planet. Sci.*, in press. [4] Sandford S. et al. (2000). In *UV, Optical, and IR Space Telescopes and Instruments*, (eds. J. Breckinridge & P. Jakobsen), *Proc. SPIE*, 4013, 604-615.